alternative embodiment, an alternative MRBR may be formed by disposing two DBR mirrors on opposing surfaces of an intervening layer, such as a piezoelectric (electrooptic) layer. Such a reflector will form an etalon, which has a reflectivity profile having a plurality of reflectivity peaks. Such a reflector may be referred to as a DBR-piezoelectric-etalon reflector. The reflectivity and spacing of the peaks depend on the reflectivity profiles of the two DBRs and the intervening piezoelectric layer, including the refractive index and thickness of the intervening piezoelectric layer. For example, comparatively low reflectivity (e.g., about 80%) dielectric DBRs may be employed, to give rise to etalon reflectivity peaks well above 99% in reflectivity. The characteristics of such a reflector may be selected, for example, so that the reflectivity peaks fall on ITU grid wavelengths, and may be integrated into, e.g., a two-section VECSEL. The gain spectrum may cover several of these reflectivity peaks, and may be adjusted to select lasing at one of them. Additionally, a voltage can be applied across the piezoelectric layer to change its index of refraction and to shift the reflectivity peaks. This may be used, for example, to fine-tune the lasing wavelength when the laser is locked onto a given one of the reflectivity peaks. Alternatively, the characteristics of such a DBR-piezoelectric-etalon reflector may be selected, for example, so that they are widely spaced so that only a single reflectivity peak falls within the gain spectrum. In this case, a voltage across the piezoelectric layer may be varied to shift (in wavelength terms) the reflectivity peak closest to the gain spectrum maximum, to tune or change the lasing wavelength.

[0210] In the present application, a "non-section-112(6) means" for performing a specified function is not intended to be a means under 35 U.S.C. section 112, paragraph 6, and refers to any means that performs the function. Such a non-section-112(6) means is in contrast to a "means for" element under 35 U.S.C. section 112, paragraph 6 (i.e., a "section-112(6) means"), which literally covers only the corresponding structure, material, or acts described in the specification and equivalents thereof.

[0211] Some embodiments or aspects of the present invention can also be embodied in the form of computer-implemented processes and apparatuses for practicing those processes. The present invention can also be embodied in the form of computer program code embodied in tangible media, such as floppy diskettes, CD-ROMs, hard drives, or any other computer-readable storage medium, wherein, when the computer program code is loaded into and executed by a computer, the computer becomes an apparatus for practicing the invention. The present invention can also be embodied in the form of computer program code, for example, whether stored in a storage medium, loaded into and/or executed by a computer, or transmitted as a propagated computer data or other signal over some transmission or propagation medium, such as over electrical wiring or cabling, through fiber optics, or via electromagnetic radiation, or otherwise embodied in a carrier wave, wherein, when the computer program code is loaded into and executed by a computer, the computer becomes an apparatus for practicing the invention. When implemented on a future general-purpose microprocessor sufficient to carry out the present invention, the computer program code segments configure the microprocessor to create specific logic circuits to carry out the desired process.

[0212] The present invention, therefore, is well adapted to carry out the objects and attain the ends and advantages mentioned, as well as others inherent therein. While the invention has been depicted and described and is defined by reference to particular preferred embodiments of the invention, such references do not imply a limitation on the invention, and no such limitation is to be inferred. The invention is capable of considerable modification, alteration and equivalents in form and function, as will occur to those ordinarily skilled in the pertinent arts. The depicted and described preferred embodiments of the invention are exemplary only and are not exhaustive of the scope of the invention. Consequently, the invention is intended to be limited only by the spirit and scope of the appended claims (if any), giving full cognizance to equivalents in all respects.

What is claimed is:

1. A wavelength locker apparatus for achieving or maintaining wavelength lock for a tunable laser designed to generate light at a selected one of a plurality of target wavelengths, the wavelength locker apparatus comprising:

a reflectively coupled zigzag waveguide device for receiving a portion of light output by the tunable laser, the zigzag waveguide device having a plurality of filters, each having a passband centered at a respective one of the plurality of target wavelengths, whereby said zigzag waveguide device produces a plurality of filtered light outputs;

a plurality of photosensors, one for each of said plurality of filters, each said filter positioned to receive a respective one of the plurality of filtered light outputs, each said filter producing a filter output signal related to the intensity of said portion of light in the passband of the corresponding filter; and

a processor for generating, in response to the plurality of filter output signals, a control signal to adjust the lasing wavelength of the tunable laser to achieve or maintain said selected one of the target wavelengths.

2. A method for controlling the wavelength of light output by a tunable laser, said tunable laser being designed to generate light at a selected one of a plurality of target wavelengths, the method comprising the steps of:

coupling said light output by the laser into a reflectively coupled zigzag waveguide device having a plurality of filters, each having a passband centered at a respective one of the plurality of target wavelengths;

producing, with the zigzag waveguide device, a plurality of filtered light outputs corresponding to said light filtered by the respective passbands of said plurality of filters;

producing, with each of a plurality of photosensors positioned to receive a respective one of the plurality of filtered light outputs, a filter output signal related to the intensity of said portion of light in the passband of the corresponding filter; and

generating, with a processor, in response to the plurality of filter output signals, a control signal to adjust the lasing wavelength of the tunable laser to achieve or maintain said selected one of the target wavelengths.

3. A zigzag waveguide device for monitoring light from a tunable laser, comprising:

a first waveguide coupled to the laser to receive light output;

a first wavelength filter coupled to the first waveguide to receive light therefrom, the first wavelength filter transmitting a band of wavelengths and reflecting one or more bands of wavelengths;

a second waveguide coupled to the first wavelength filter to receive light reflected from the first wavelength filter;

a mirror coupled to the second waveguide to receive light from the second waveguide;

a third waveguide coupled to the mirror to receive light reflected from the mirror;

a second wavelength filter coupled to the third waveguide to receive light therefrom, the second wavelength filter transmitting a band of wavelengths different from the band of wavelengths transmitted by the first wavelength filter and reflecting one or more bands of wavelengths;

a first photodiode coupled to receive light transmitted by the first wavelength filter;

a second photodiode coupled to receive light transmitted by the second wavelength filter; and

a laser wavelength controller coupled to the tunable laser and capable of modifying the wavelength of the tunable laser based at least in part on an output of one of the first and second photodiodes.

4. The zigzag waveguide device of claim 3, wherein the transmission bands of the first and second wavelength filters are in the range of 1500-1600 nm.

5. The zigzag waveguide device of claim 3, further comprising:

a fourth waveguide coupled to the second wavelength filter to receive light reflected from the second wavelength filter and also coupled to transmit light to the mirror;

a fifth waveguide coupled to the mirror to receive light reflected from the mirror;

a third wavelength filter coupled to the fifth waveguide to receive light therefrom, the third wavelength filter transmitting a band of wavelengths different from the bands of wavelengths transmitted by the first and second wavelength filters and reflecting one or more bands of wavelengths; and

a third photodiode coupled to receive light transmitted by the third wavelength filter; and

wherein the laser wavelength controller is capable of modifying the wavelength of the tunable laser based at least in part on an output of one of the first, second, and third photodiodes.

6. The zigzag waveguide device of claim 3, wherein the bands of wavelengths transmitted by the first and second wavelength filters each include one wavelength from the ITU grid.

7. The zigzag waveguide device of claim 3, wherein the first wavelength filter is a DBR.

8. The zigzag waveguide device of claim 7, wherein the DBR comprises a plurality of layers and further comprising a means for modifying the index of refraction of at least one of those layers.

9. The zigzag waveguide device of claim 3, wherein the first waveguide receives laser light produced by a plurality of lasers, including a second tunable laser and further comprising:

a second laser controller that is capable of modifying the wavelength of the second tunable laser based at least in part on an output of one of the first and second photodiodes.

10. The zigzag waveguide device of claim 3, wherein the first and second wavelength filters receive laser light at the same angle of incidence.

11. A method for controlling the wavelength of tunable laser output, comprising the steps of:

coupling laser light from the output of a laser into a first waveguide;

coupling laser light from the first waveguide to a first wavelength filter that transmits a band of wavelengths and reflects one or more bands of wavelengths;

coupling laser light reflected from the first wavelength filter into a second waveguide;

coupling laser light from the second waveguide to a mirror;

coupling laser light reflected from the mirror into a third waveguide;

coupling laser light from the third waveguide to a second wavelength filter that transmits a band of wavelengths different from the band transmitted by the first wavelength filter and reflects one or more bands of wavelengths;

coupling laser light transmitted by the first wavelength filter to a first photodiode;

coupling laser light transmitted by the second wavelength filter to a second photodiode; and

adjusting the wavelength of the laser based at least in part on an output of one of the first and second photodiodes.

12. The method of claim 11, wherein the laser light from the output of a laser is coupled to the first waveguide by an optical tap.

13. The method of claim 11, wherein the transmission bands of the first and second wavelength filters are in the range of 1500-1600 nm.

14. The method of claim 11, further comprising the steps of:

coupling laser light reflected from the second wavelength filter into a fourth waveguide;

coupling laser light from the fourth waveguide to the mirror;

coupling laser light reflected from the mirror into a fifth waveguide;

coupling laser light from the fifth waveguide to a third wavelength filter that transmits a band of wavelengths